**Before the**
**FEDERAL COMMUNICATIONS COMMISSION**
**Washington, D.C. 20554**

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| In the Matter of | ) | |
| | ) | |
| Allocation of Spectrum in the 5 GHz Band | ) | RM-8653 |
| To Establish a Wireless Component of the | ) | |
| National Information Infrastructure | ) | |
| | ) | |
| Petition for Rulemaking to Allocate | ) | RM-8648 |
| the 5.1 - 5.35 GHz Band and Adopt | ) | |
| Service Rules for a Shared Unlicensed | ) | |
| Personal Radio Network | ) | |



# COMMENTS OF APPLE COMPUTER, INC.

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## SUMMARY

Recent statements by Chairman Hundt stressing the importance of networking, the role of schools and libraries in tomorrow's information economy, and the FCC's role in preserving broad access to the spectrum resource, echo the sentiments of more than two hundred and twenty-five individuals and groups who filed comments supporting the Petitions filed by Apple and WINForum for a new, broadband unlicensed wireless communications service.

People from across the country, speaking on behalf of schools, libraries, state and local governments, disabled persons, civic networks, communities, small businesses, equipment manufacturers, and individual users described the array of benefits that could be achieved through an allocation of unlicensed spectrum capable of carrying a mixture of communications and applications, including those requiring high-bandwidth and longer distance links.

Of particular interest to Apple was the strong support for the fundamental concept underlying its NII Band proposal: that the spectrum must be shared equitably by all users, without preclusive priority for any type of user or type of communication.

In sum, the comments reflected virtually unanimous agreement that: (1) unlicensed services are an essential part of the NII, (2) other technologies and services will not adequately serve the full range of communications needs across geography, income, and type of use, and, as a result, (3) unlicensed services must be given the opportunity to flourish through appropriate, adequate spectrum allocations.

A few entities expressed limited reservations to the proposals set out in the Petitions. In particular, several existing and proposed users of the 5 GHz bands expressed concerns that unlicensed devices could cause unacceptable interference to their operations. Apple does not propose that any existing or planned user be relocated from the 5 GHz band. Apple also concurs that additional work must be done to document the existing and planned uses of the 5 GHz band and to determine the circumstances under which sharing between these users and new, unlicensed devices will be possible. Apple believes,

however, that sharing solutions are possible, and that these issues must be addressed on their merits in the context of an FCC rulemaking proceeding.

A very small number of commenting parties recommended that the FCC exclude "community networks" from the proposed NII Band. These arguments ignore the fact that many links within community networks, and indeed many entire community networks, will never be built, and their potential users will remain unserved, if unlicensed services are not available as an option. They also ignore the spectrum inefficiencies associated with mandating that users employ a dedicated link when their needs could be met using a shared unlicensed band, as well as the fact that unlicensed community network links are not mutually exclusive with one another or with more traditional, smaller area unlicensed networks.

Finally, the comments reflect broad agreement that the FCC should adopt an NPRM that proposes the broad outlines for regulating the NII Band, but should give a representative industry body responsibility for developing the specific technical rules governing the NII Band.

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## REPLY COMMENTS OF APPLE COMPUTER, INC.

> The key feature of the information highway is going to be networking...it will be networks that will weave homes, government, schools, hospitals and businesses into a national community.... I see the schools and libraries as the sparkling points, a thousand public hearths attracting community members to the light of the national information network.... Our common job, then, is to hook up the libraries and classrooms."[1]
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> "[W]hat is the purpose of the FCC[?] First, the FCC manages the public property of the airwaves to promote the public interest. This means, among other things, that we make sure that new businesses and small businesses have a chance to gain access to spectrum. Without us, the big established companies would be in total control of the communications revolution. These are fine companies but they shouldn't be the only ones involved in the most important industry in this country's future."[2]

These recent statements by Chairman Hundt echo the sentiments of more than two hundred and twenty-five individuals and groups who filed comments

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[1] Speech by Reed E. Hundt, Chairman, Federal Communications Commission, Annual Legislative Conference, National Association of Counties, Washington, D.C. (March 5, 1995).

[2] Remarks of Chairman Reed E. Hundt, American Mobile Telecommunications Leadership Conference (June 27, 1995) (as prepared for delivery).

supporting the petitions of Apple Computer, Inc. ("Apple") and the Wireless Information Networks Forum ("WINForum") for a new, broadband unlicensed wireless communications service (the "Petitions").[3] People from across the country, speaking on behalf of schools, libraries, state and local governments, disabled persons, civic networks, communities, small businesses, equipment manufacturers, and individual users urged the FCC to create a "public lane" on the information superhighway. While the specific statements varied from commenter to commenter, the comments almost universally expressed strong support for prompt action.

## I. THE COMMENTS REFLECTED VERY STRONG SUPPORT FOR THE PETITIONS.

The comments described an array of benefits that could be achieved through an allocation of unlicensed spectrum capable of carrying a mixture of communications and applications, including those requiring high-bandwidth and longer distance links. Broadband unlicensed wireless connections could promote education,[4] offer new possibilities for libraries to serve as information "gateways,"[5] enhance opportunities for public dialog,[6] enable small companies

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[3] It would be impossible for Apple to cite to each of the individual comments that discussed the need for the NII Band or the benefits that this band could provide to users. Apple has included representative — but not exhaustive — citations, but intends no slight to the many supportive comments filed with the FCC that are not mentioned in this brief reply.

[4] E.g., Comments of the Council of Chief State School Officers; Joint Comments of the Education Organizations (the American Educational Research Association, the Software Publishers Association, the Triangle Coalition for Science and Technology Education, and the National School Boards Association); Comments of Sheri Edwards; Comments of Rodger Hendricks, Center for Instructional and Research Computing Activities, University of Florida; Comments of the National Education Telecommunications Organization/the Education Satellite Institute; Comments of Bruce Umbaugh, Assistant Professor of Philosophy, Webster University; Comments of Mark D. LeBlanc, Wheaton College; Comments of Microsoft Corporation at 3; Comments of Metricom Inc. at 5.

[5] E.g. Comments of the American Library Association; Comments of the Eastern Shore Public Library; Comments of Mike McGuire, Director, Traverse Area District Library; Comments of Chris Mays.

[6] E.g. Comments of Americans Communicating Electronically; Comments of M. Carling, Chairman, Bay Area NeXT Group; Comments of the Center for Democracy and Technology ("CDT"); Comments of Duncan, Weinberg, Miller & Pembroke, P.C. ("Duncan, Weinberg"); Comments of the Electronic Frontier Foundation; Comments of Thomas E. Kunselman; Comments of Michael Chui, Executive Director, HoosierNet; Comments of Sue Beckwith, Executive Director, Austin Free-Net.

to design and deploy cost-effective networks suited to their needs,[7] create opportunities for small businesses to participate in the information/ communications economy,[8] link rural and low income communities and those with special needs to the broader information infrastructure,[9] promote community development,[10] improve health care,[11] and improve energy use and promote conservation.[12] Importantly, the NII Band would achieve these benefits using a market-based solution, without government mandates and without government subsidies, other than dedication of the required spectrum.

Moreover, Apple's proposed NII Band would promote full use of scarce spectrum resource,[13] spur innovation in wireless technologies,[14] promote interoperability with the European HIPERLAN allocation and create new export opportunities,[15] enhance U.S. technological leadership,[16] and increase business productivity.[17]

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[7] E.g. Comments of Cannon Research at 1; Comments of Rob Narberes, Lab Services Supervisor, DNA Plant Technology Corporation; Comments of John Fix 3rd, Owner, Cornell's True Value Hardware; Comments of John R. Levie.

[8] E.g., Cannon Research Comments at 1; Comments of Kenneth J. McCarthy, President, e-media; Comments of Kent Borg; see also Comments of Walker M. Lomia, a professional software engineer and researcher, Software Engineering Institute, Carnegie Mellon University.

[9] E.g. Comments of David A. Ross, Senior Biomedical Research Engineer, Department of Veterans Affairs Medical Center (Atlanta); Comments of Gary W. Kelly; Comments of Microsoft Corporation at 2; Comments of Michael Gersten; Comments of Susan D. Prince; Comments of Michael Papadopoulos, Ph.D.; Comments of James G. Kimball; Comments of Robert Brewer. Mr. Ross and Mr. Kelly's comments, in particular, provide a fascinating overview of the ways in which unlicensed wireless technologies could be used to improve the quality of life for aging veterans and disabled persons.

[10] E.g. Comments of Aaron Laramore, Executive Director, Organized Neighbors Yielding Excellence, Inc. ("Laramore"); Comments of Noel Dunne, Director, SLU Christian Community Services; Comments of Marna Hauk.

[11] E.g. Comments of Michael Silverberg, Associate Professor of Medicine, Stony Brook Health Sciences Center; Microsoft Comments at 3; Metricom Comments at 4-5.

[12] Metricom Comments at 4.

[13] E.g. Comments of Andrew Corporation at 3.

[14] E.g. Andrew Comments at 3-4.

[15] E.g. Andrew Comments at 8; Comments of Compaq Computer Corporation at 3; Comments of Digital Microwave Corporation at 2; Comments of Harris Corporation - Farinon Division at 1, 3-4; Comments of Hewlett-Packard Company ("HP") at 5-6; Comments of the Information Technology Industry Council ("ITI") at 2; Comments of Motorola, Inc. at 3; Comments of Northern Telecom Inc. ("NTI") at 3; Comments of Kent Borg.

[16] e-media Comments at 1; HP Comments at 5; Microsoft Comments at 1; Comments of Tetherless Access Ltd. ("TAL") at 5.

[17] NTI Comments at 3.

Of particular interest to Apple was the strong support for the fundamental concept underlying its NII Band proposal: a spectrum allocation that is available to all technologies operating in conformance with an agreed-upon set of technical rules designed to assure equitable sharing of the spectrum resource, without preclusive priority for any type of user or type of communication.[18]

In sum, the comments reflected virtually unanimous agreement that: (1) unlicensed services are an essential part of the NII; (2) other technologies and services — both wired and licensed-wireless — will not adequately serve the full range of communications needs, across geography, income, and type of use; and, as a result, (3) unlicensed services must be given the opportunity to flourish through appropriate, adequate spectrum allocations.

## II. THE LIMITED RESERVATIONS EXPRESSED BY A SMALL NUMBER OF COMMENTING PARTIES EITHER LACK MERIT OR SHOULD BE ADDRESSED IN THE CONTEXT OF A RULEMAKING PROCEEDING.

### A. Inter-Service Sharing Issues Should Be Addressed As Part Of The Rulemaking Process.

Several existing and proposed users of the 5 GHz bands filed comments on one or both of the Petitions expressing concerns that unlicensed devices could

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[18] E.g. Laramore Comments at 2; Andrew Comments at 1, 9; Cannon Research Comments at 1; CDT Comments at 6; Digital Microwave Comments at 3; Duncan, Weinberg Comments at 3; Comments of Knowledge Industries at 1; Comments of the Part 15 Coalition at 2, 8; TAL Comments at 3, 4; Compaq Comments at 3; Metricom Comments at 8.

cause unacceptable interference to their operations.[19] Several other parties supported the Petitions, but agreed that sharing issues must be addressed.[20]

Apple concurs that additional work must be done to document the existing and planned uses of the 5 GHz band and to determine the circumstances under which sharing between these users and new, unlicensed devices will be possible. That said, however, Apple believes that it is important to place the sharing situation in context.

First, Apple has not proposed that any existing or planned user be relocated from the 5 GHz band.[21] Its recommendation that NII Band devices be regulated under a "Part 16" structure and be afforded co-primary status is intended to provide certainty to all users — both NII Band and others — by developing mutually acceptable sharing solutions that would govern future operation in the band. Apple does not propose that NII Band technologies would receive preferential treatment over any existing user or type of usage.

Second, the Commission should give no weight to any recommendation that it reject Apple's proposal prior to investigating sharing opportunities in a

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[19] One "Big LEO" licensee, Loral/Qualcomm Partnership, L.P. ("LQP") opposed the Petitions due to concerns about potential interference to its proposed 5 GHz feeder links. Another Big LEO applicant, Constellation Communications, Inc. ("Constellation"), filed comments suggesting that further sharing studies are required. The Federal Aviation Administration ("FAA") opposed WINForum's proposed use of the 5000-5150 MHz band, but did not oppose unlicensed use of the 5150-5250 MHz band on a secondary basis if sharing studies show that unlicensed devices can co-exist with planned aeronautical radionavigation safety systems. Finally, several Amateur Radio Service users and organizations filed comments expressing concerns about potential interference to Amateur Radio Service users. Comments of the American Radio Relay League, Incorporated ("ARRL"); Comments of William J. Kaiser; Comments of the Northern Amateur Relay Council of California, Inc. ("NARCC"); Comments of David M. Shaw; Comments of Samuel F. Wood.

[20] Notably, several Amateur Radio Service users supported the NII Band Petition, although they generally agreed that suitable sharing solutions should be developed. See Comments of Francis A. Ney, Jr.; Comments of Ed Epley; Comments of Dewayne Hendricks; Comments of Richard Hodges; Comments of Bruce Perens. See also Comments of the Southern California Repeater and Remote Base Association at 16 ("SCRRBA") (expressing strong concerns about sharing issues but agreeing that "[t]he basis concept is of sufficient merit that further consideration should occur").

[21] See ARRL Comments at 2-3; NARCC Comments at 5; SCRRBA Comments at 9, 11-12, 13, 14; David Shaw Comments.

rulemaking proceeding.[22] There is insufficient information for Apple, or the Commission, to identify, characterize, and resolve all potential interference issues at this stage of the proceeding. Many uses are currently in the design or development stage or are part of non-public communications networks. Sharing solutions, therefore, can be developed only through discussions with affected parties. After the FCC issues an NPRM, these parties will have the opportunity to provide the necessary information about and resolve sharing issues.[23]

Finally, while incumbent users have a legitimate expectation that their needs will be accommodated in authorizing new spectrum uses, they do not have the right to exclusive use of the band.[24] As a result, the FCC should reject claims that overstate the risks of interference,[25] that seek to limit the use of bands other than those a party is authorized to use,[26] or that unreasonably would delay or restrict implementation of the NII Band.[27]

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[22] See LQP Opposition at 3, 5; ARRL Comments at 2-3, 10, 12-13; cf. William Kaiser Comments at 1; NARCC Comments at 6.

[23] Sharing issues are commonly addressed during a rulemaking process — for example, as LQP is aware, inter-service sharing issues were a major focus of the FCC's MSS Above 1 GHz Negotiated Rulemaking Committee. Contrary to Constellation's suggestion, Constellation Comments at 5-6, a separate NOI is not required, and would only insert needless costs and delays into the process. Contrary to the concerns of some Amateur Radio Service operators, Apple does not propose a headlong rush by NII Band devices into the 5 GHz bands, and recognizes that Amateur Radio Service operators must be part of the process of defining the NII Band rules.

[24] For example, several existing spectrum users — including the GLONASS system, MLS system, and radioastronomy users — each spend years of effort and made accommodations in order to permit the deployment of Big LEO systems. See LQP Opposition at 6, 7; Amendment of the Commission's Rules to Establish Rules and Policies Pertaining to a Mobile Satellite Service in the 1610-1626.5/2483.5-2500 MHz Frequency Bands, Report and Order, CC Docket No. 92-166, 9 FCC Rcd 5936 (1994).

[25] For example, global MSS systems will have to design feeder link stations that are capable of operating in spectrum shared with European HIPERLAN devices and, therefore, it is reasonable to use HIPERLAN-based sharing solutions as a starting point for discussing NII Band-based sharing solutions. But see LQP Opposition at 9-10.

[26] For example, Constellation opposes any allocation in the 5000-5350 MHz band, even through it proposes to operate only in the 5000-5250 MHz band. See Constellation Comments at 2, 5. Constellation did not limit its opposition to NII Band operation in the 5250-5350 MHz band to concerns regarding out-of-band emissions and adjacent channel interference.

[27] For example, LQP said that the FCC should defer action on the Petitions until it and other MSS systems intending to use the 5 GHz band have obtained uplink authorizations throughout the world. LQP Opposition at 9. This is entirely unnecessary, since non-U.S. feeder link operations would be unaffected by the Apple and WINForum proposals, and such an approach could delay any action for years.

Some of the commenters also leveled incorrect criticisms at the Petitions, apparently in an effort to discredit them and, thereby, avoid the need to discuss sharing solutions. A few alleged that, because operation will occur on an unlicensed basis, the band will become an unworkable "free for all" and sharing solutions will be unenforceable.[28] This claim ignores the role that mandatory technical standards — adopted and updated through industry consensus, endorsed by the Commission, integrated into each product, and enforced through the Commission's equipment authorization process — will play in protecting equitable access to the spectrum resource and implementing sharing solutions. Using technology rather than rules and regulations as the basic means of "enforcing" spectrum sharing is a workable sharing model that promotes innovation and, for this reason, is a model that the Commission increasingly is using.[29]

Similarly, ARRL's suggestion that the Commission has no legal authority to allocate spectrum for unlicensed operation ignores both history and the Communications Act's express requirements.[30] The FCC first authorized operation on an unlicensed basis in 1938[31]; more recently, it has allocated spectrum specifically for unlicensed operation in the 1910-1930 MHz band and the 2390-2400 MHz band, and has proposed to allocate additional unlicensed spectrum in the bands above 40 GHz. These allocations are entirely consistent with the Act and, in fact, respond to the Act's mandate that the FCC must "[s]tudy new uses for radio ...and generally encourage the larger and more effective use of radio in the public interest"[32] and "encourage the provision of new technologies and services to the public."[33]

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[28] See ARRL Comments at 8; Constellation Comments at 4.; William Kaiser Comments at 4; LQP Opposition at 2, 5-6; SCRRBA Comments at 9.

[29] See, e.g., 47 C.F.R. §§15.301 et seq.. (unlicensed PCS rules); Amendment of Parts 2 and 15 of the Commission's Rules to Permit Use of Radio Frequencies Above 40 GHz for New Radio Applications, Notice of Proposed Rulemaking, ET Docket No. 94-124, 9 FCC Rcd 7078, ¶ 14 (1994) (discussing use of low power and spectrum sharing etiquette to avoid potential interference).

[30] ARRL Comments at 3-5.

[31] Revision of Part 15 of the Rules Regarding the Operation of Radio Frequency Devices Without an Individual License, First Report and Order, GEN Docket No. 87-389, 4 FCC Rcd 3493 ¶2 (1989).

[32] 47 U.S.C. § 303(g).

[33] 47 U.S.C. § 157(a).

Finally, Loral claimed that the FCC's decision not to propose a High Speed Wireless Data Service ("HSWDS") allocation agenda item at the upcoming WRC-95 conference somehow indicates a policy preference for MSS feeder links and against HSWDS systems. This grossly overstates the case.[34] In its decision, the FCC essentially decided to resolve the remaining MSS feeder link issues before addressing a HSWDS allocation at the international level, in order to avoid unnecessarily complicating matters at WRC-95. The FCC did not, however, decide not to proceed domestically with the allocations proposed in the Petitions.[35] Because the allocations proposed in the Petitions do not, at least initially, require an international allocation[36] or threaten MSS feeder link operations,[37] the FCC can move forward on the NII Band proposal without waiting for the conclusion of WRC-95 or undermining the United States' position at WRC-95.

### B. Community Networks Are An Essential Part Of The NII Band.

A very small number of commenting parties recommended that the FCC exclude "community networks" from the proposed NII Band. Specifically, the fixed microwave interests — Alcatel Network Systems, Inc. ("ANS"), Digital Microwave Corporation, Harris Corporation - Farinon Division, and the Fixed Point-to-Point Communications Section, Network Equipment Division of the Telecommunications Industry Association — argued that the FCC should force those employing point-to-point paths to use licensed fixed microwave systems rather than the NII Band. In addition, LQP urged the FCC to restrict outdoor use

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[34] See LQP Opposition at 2-3, 6-9; see also ARRL Comments at 8-9.

[35] See Preparation for International Telecommunication Union World Radiocommunication Conferences, Report, IC Docket No. 94-31, ___ FCC Rcd ___, ¶ 97 (June 15, 1995) (specifically referencing Apple and WINForum Petitions and stating that "it has yet to be demonstrated that an international allocation is necessary to implement [an unlicensed high speed wireless data service] in the U.S.").

[36] Id; Apple Comments at n.42. ARRL is mistaken that a new ITU allocation for a fixed and mobile service is required, at least for an initial "Part 15" type allocation, or that the United States' earlier decision not to include itself within Footnote 803 somehow precludes the FCC from now determining that the uses proposed by Apple and WINForum are in the public interest. ARRL Comments at 5-6. With respect to Mexican/Canadian coordination and coordination with government users, ARRL Comments at 11 n.9, this will be done as part of the general coordination process, to the extent necessary.

[37] As discussed in Section II(A), *supra*, Apple is committed to resolving sharing issues and has not requested that MSS feeder links be denied access to the 5 GHz band.

of NII Band devices[38] and some Amateur Radio Service users suggested that the Commission restrict longer-distance paths, at least in the upper 150 MHz band.[39]

These arguments ignore three crucial facts. First, many of the point-to-point connections within a "community network" could not be built using conventional fixed microwave technologies. Commercial microwave systems offer a highly reliable service, but at a very high price,[40] and are subject to cumbersome licensing and frequency coordination requirements. As a result, they are, quite simply, not an option for many users, particularly small public service organizations with limited finances.[41] If the Commission mandates that licensed microwave channels must in all cases be used for fixed point-to-point links, many links within community networks, and indeed many entire community networks, will never be built, their potential users will remain unserved, and the NII Band will be an empty promise in many areas of the country.

Second, many community networks will not require dedicated microwave spectrum. Users may need a high-bandwidth channel a few times a day or a fairly constant low rate data stream downloading information from the Internet. To mandate that each point-to-point link within a community network must use a dedicated microwave channel — whatever its capacity requirements — would be inefficient use of the spectrum and could clutter the microwave bands.

Most importantly, these users are not mutually exclusive with one another or with other spectrum users and, therefore, do not need to be moved to different technologies and higher bands in order to "preserve" the 5 GHz band for more

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[38] LQP Opposition at 10.
[39] ARRL Comments at 3, 7; SCRRBA Comments at 15-16, 17.
[40] UTAM, for example, estimates that it will cost $200,000 for each microwave link relocated from the 2 GHz band, and states that the costs for digital microwave systems may be "substantially" higher. "UTAM Plan for Financing and Managing 2 GHz Microwave Relocation," GEN Docket No. 90-314, at 27 and n.25 (filed Aug. 1, 1994). See also Comments of the Personal Communications Industry Association, RM-8643, at 5 (proposing cap on industry-shared microwave relocation costs of $250,000 per link, plus $150,000 when a new tower is required) (filed June 15, 1995). Even using the lowest of these estimates, a community network employing fifteen links (for example, to connect ten schools and five libraries to a central hub) would have an initial cost of approximately $3 million.
[41] E.g. Andrew Comments at 4.

traditional, smaller area unlicensed networks. Like shorter distance NII Band devices, these devices will operate at a very low power and pursuant to a set of technical rules, such as listen-before-talk, designed to protect equitable access. Moreover, these links will most likely be used in rural and similar areas, where alternatives are unavailable, and therefore it is relatively unlikely that they will be in sufficiently close proximity to other unassociated NII Band networks to adversely affect those networks' operations.

In assessing the need for unlicensed wireless community network connections, the Commission should focus on what community networks are, and what they are not. There is no single model for community networks. Most fundamentally, community networks are a resource: they will make it possible for citizens to band together through their government, their libraries, their schools, or in other collectives to connect themselves to each other and to the broader information infrastructure. Each network will evolve in the ways that are best suited to meeting the relevant community's needs, in light of local geography, communications requirements, costs, funds, and available options.

Each community network will combine a variety of technologies — including wired, licensed-wireless, and unlicensed-wireless technologies — to create an overall solution that is optimized for the local user group. Community networks will be an extension of, rather than a replacement of, other wired and wireless networks. For example, a simple community network could be created using several fixed unlicensed wireless links, each with a wireless LAN permitting mobile communications at the terminal points (*e.g.*, within each library or school).

A more elaborate network could be created by adding a connection from the network hub to the broader telecommunications infrastructure, for example, connecting to the telephone company's nearest point of presence; this connection could be over a dial-up telephone line, a dedicated fiber optic circuit, a microwave link, or an unlicensed wireless link, depending on the cost of each of these alternatives, the desired reliability, the amount of traffic to be generated, and other factors. Similarly, individual links between buildings in a network could be wired or wireless, licensed or unlicensed, depending upon what makes sense under the circumstances.

In particular, unlicensed links within a community network most likely will be used when other options are unavailable, prohibitively expensive, or unsuited to the users' needs. Given the fact that these links are low power and have non-preclusive rights to the spectrum, they are unsuited to wide area mobile communications and cannot guarantee high degrees of reliability. As a result, they will augment — but can never replicate — other wired and licensed-wireless technologies.[42]

Unlicensed wireless technologies are an essential piece of the community network application, expanding the range of communities within which such networks are possible, as well as the potential scope of each network that is deployed. Community groups should not be denied the efficiencies and opportunities offered by unlicensed devices for longer range community network links merely because one is accustomed to thinking of unlicensed operation as short range. If community networks can operate within the NII Band without harming other NII Band users or others sharing the 5 GHz band, they should be encouraged, not prohibited.[43]

### C. 300 MHz Of Unlicensed Spectrum In the 5 GHz Range Is Required To Satisfy The Predicted Need For Wireless, Broadband Connections.

One manufacturer argued that the Commission should initially allocate only 150 MHz of 5 GHz unlicensed spectrum, with a possible increase at a later time, apparently due to concerns that the allocation of the upper 150 MHz proposed by Apple could adversely affect Part 15 and ISM use of the upper band.[44] Several other existing or planned users of the 5 GHz band also

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[42] See Amendment of Parts 2 and 15 of the Commission's Rules to Permit Use of Radio Frequencies Above 40 GHz for New Radio Applications, Notice of Proposed Rulemaking, ET Docket No. 94-124, 9 FCC Rcd at ¶ 13 ("Certain applications, particularly those covering wide areas or requiring large investment in infrastructure, may not be able to accept the restrictions that accompany unlicensed use or, may require the additional protection from interference that can be afforded under a licensed service.").

[43] Several of the comments specifically mentioned the potential benefits of unlicensed wireless community networks. See, e.g. Cannon Research Comments at 2; Duncan, Weinberg Comments; ITI Comments at 4; Part 15 Coalition Comments at 3-4; Comments of J. Clifton Moyers, Jr.; Comments of L. Edward Knudson.

[44] Andrew Comments at 6.

contended that the need for a 5 GHz unlicensed allocation has not yet adequately been demonstrated.[45] These claims should be rejected.

First, an NII Band allocation would enable the development of a highly beneficial public resource that could help achieve universal service goals, expand the NII, and meet the needs of potential information "have-nots." This all could be accomplished without displacing or disrupting any existing or planned use of the 5 GHz spectrum. The NII Band, therefore, represents an optimal use of the radio spectrum and should be adopted without any reduction.

Second, bandwidth in the range of 300 MHz will be required to meet the growing demand for multi-media, graphics, and digitized video and voice transmissions. For example, an MPEG-3 compressed progressive video signal currently requires individual data streams of 18 Megabits per second. This cannot be accommodated in the recently allocated Data-PCS bands; moreover, wireless technologies must keep pace with the evolution in bandwidth requirements.[46] A high-bandwidth allocation also is necessary to support multiple users, each of whom requires a high-bandwidth connection in a crowded operating environment.

Finally, as discussed in Apple's Petition and in the various comments, these objectives cannot be met using wired technologies, licensed-wireless services, or any other existing or proposed unlicensed band.[47] The proposed 5 GHz allocation is a quantum leap forward in the development of wireless technologies. It, alone, can satisfy demand for community networks and for high-bandwidth wireless data connections, and is a necessary part of a comprehensive set of wireless alternatives.

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[45] ARRL Comments at 3, 6-7, 13; FAA Comments at 3; LQP Opposition at 1, 12-14; Constellation Comments at 4-5.

[46] See, e.g., Comments of Charles C. Kankelborg (discussing high bandwidth applications in the field of astrophysics); Compaq Comments at 2-3; Microsoft Comments at 2; Motorola Comments at 2..

[47] See, e.g. Compaq Comments at 2-3; HP Comments at 3-5, 6-7; ITI Comments at 5-6; Motorola Comments of at 4; Part 15 Coalition Comments at 4-5; Metricom Comments at 6-7. Contrary to LQP's suggestion, LQP Comments at 14, Apple does not claim that each of the other unlicensed bands is currently "full." Rather, it and others have explained that a 300 MHz 5 GHz allocation is needed to provide a suitable range of unlicensed wireless alternatives and that overall demand for unlicensed technologies is sufficient to justify each of the existing and proposed unlicensed allocations.

### D. Technical Rules Should Be Developed During The Rulemaking Process.

The comments demonstrated strong support for the FCC adopting an NPRM that proposes the broad outlines for establishing the NII Band — in particular, a 300 MHz spectrum allocation; transmissions of data in packetized form; low power, unlicensed operation pursuant to an overarching set of technical rules designed to assure equitable access to the spectrum resource, and Part 16 operation — but leaves to industry principal responsibility for developing the specific technical rules needed to prevent interference and assure equitable sharing.[48]

### E. Pulson's Alternative Proposal Should Be Rejected.

Pulson Communications ("Pulson") urged the Commission to reject Apple's proposal and, instead, to clear the entire 2.5-8.5 GHz band for use exclusively by ultra-wideband technologies.[49] Pulson's proposal is not a substitute for Apple's low cost, low power, HIPERLAN-compatible NII Band. As a result, it not stand in the way of Apple's proposal.

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[48] E.g. Andrew Comments at 9 n.14; Compaq Comments at 3; HP Comments at 2; ITI Comments at 6; Microsoft Comments at 1-2, 5; Motorola Comments at 3; NTI Comments at 5; Part 15 Coalition Comments at 9-10; Metricom Comments at 8. Apple wishes to clarify that its reference to an industry-based process for developing rules was meant to be broadly inclusive, not preclusive. Apple agrees that input should be sought from all affected parties and should reflect the shared expertise of those available. See, e.g., Comments of Bruce Perens (describing expertise of Radio Amateur Service users and their potential contributions to the standards setting process).

[49] Comments of Pulson Communications at 1-2.

## CONCLUSION

For the reasons discussed herein and in Apple's Petition and Comments, Apple urges the FCC to respond to the overwhelming support for Apple's Petition by promptly adopting an NPRM proposing a 5 GHz "NII Band" unlicensed allocation.

Respectfully submitted,

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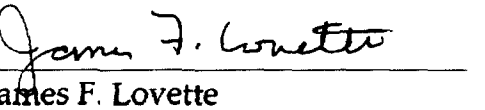

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July 25, 1995

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I hereby certify that a true and correct copy of the foregoing Reply Comments of Apple Computer, Inc., was sent by first-class mail, postage prepaid, this 25th day of July, 1995, to each of the following:

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